Electronic Version
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Claims

[c1] 1. A method of operating an optical module/printer module system that uses a changer to drive either the optical module or the printer module, wherein a first module and a second module are defined such that if the optical module is the first module, the printer module is the second module and if the printer module is the first module, the optical module is the second module, the method comprising the steps of:
the first module couples with the changer so that the changer is able to drive the first module;
the changer rotates so that the changer detaches from the first module and engages with the second module; and
the changer drives the second module.

[c2] 2. The operating method of claim 1, wherein the changer includes a lever rod and a roller, the roller has a spiral groove on a side surface that spirals around the central axis of the roller, depth of the groove increases gradually, and on rotating the changer, the lever rod dips into the spiral groove and presses against the bottom surface so that the roller rotates leading to the detachment of

the first module from a latching element on the roller and engagement of the latching element with the second module.

[c3] 3. The operating method of claim 2, wherein depth of the spiral groove increases gradually in a clockwise direction.

[c4] 4. The operating method of claim 2, wherein depth of the spiral groove increases gradually in an anti-clockwise direction.

[c5] 5. The operating method of claim 2, wherein the roller has at least a latching element on the perimeter surface of the roller through which the roller latches either with the first module or the second module.

[c6] 6. The operating method of claim 2, wherein the latching element includes a bump-shape structure.

[c7] 7. The operating method of claim 5, wherein the latching element retracts into the interior of the roller when an external force is applied to the latching element and the latching element springs back to its original position when the external force is removed.

[c8] 8. The operating method of claim 2, wherein the lever rod is fixed in position and the roller rotates by moving

the roller towards the lever rod so that the end of the lever rod presses against the bottom section of the spiral groove.

[c9] 9. The operating method of claim 2, wherein the lever rod is movable and the roller rotates when the lever rod moves into the spiral groove and presses against the bottom section of the spiral groove.

[c10] 10. A changer for driving a first module or a second module, the changer comprising:
a roller having at least a latching element for latching with either the first module or the second module, wherein the roller further includes a first spiral groove on a side surface of the roller and the first spiral groove spirals around the central axis of the roller such that depth of the first spiral groove increases gradually, and the roller also includes a second spiral groove on another side surface of the roller and the second spiral groove spirals around the central axis of the roller such that depth of the second spiral groove increases gradually;
a first lever rod for dipping into the first spiral groove and pressing against the bottom surface of the first spiral groove; and
a second lever rod for dipping into the second spiral groove and pressing against the bottom surface of the

second spiral groove.

[c11] 11. The changer of claim 10, wherein the first spiral groove and the second spiral groove are located on the same side surface of the roller, the direction of increasing depth for the second spiral groove is opposite to the direction of increasing depth for the first spiral groove, and hence the direction of rotation of the roller when the first lever rod dips into the first spiral groove is opposite to the direction of rotation of the roller when the second lever rod dips into the second spiral groove.

[c12] 12. The changer of claim 10, wherein the roller moves in a straight line and the first lever rod and the second lever rod are located at the same end of the traveling pathway of the roller.

[c13] 13. The changer of claim 10, wherein the roller includes a first side surface and a corresponding second side surface, the first spiral groove is located on the first side surface of the roller while the second spiral groove is located on the second side surface of the roller, and the direction of rotation of the roller when the first lever rod dips into the first spiral groove is opposite to the direction of rotation of the roller when the second lever rod dips into the second spiral groove.

[c14] 14. The changer of claim 10, wherein the roller moves in a straight line and the first lever rod and the second lever rod are located at the opposite end of the traveling pathway of the roller.

[c15] 15. The changer of claim 10, wherein the first module is an optical module and the second module is a printer module.

[c16] 16. The changer of claim 10, wherein the first module is a printer module and the second module is an optical module.

[c17] 17. The changer of claim 10, wherein the latching element is a bump-shape structure located on the perimeter surface of the roller.

[c18] 18. The changer of claim 10, wherein the latching element is located on the perimeter surface of the roller and the latching element retracts into the interior of the roller when an external force is applied to the latching element and the latching element springs back to its original position when the external force is removed.

[c19] 19. The changer of claim 10, wherein the first lever rod is fixed in position and the roller rotates by moving the roller towards the first lever rod so that the end of the first lever rod presses against the bottom section of the

first spiral groove.

[c20] 20. The changer of claim 10, wherein the second lever rod is fixed in position and the roller rotates by moving the roller towards the second lever rod so that the end of the second lever rod presses against the bottom section of the second spiral groove.

[c21] 21. The changer of claim 10, wherein the first lever rod is movable and the roller rotates when the first lever rod moves into the first spiral groove and presses against the bottom section of the first spiral groove.

[c22] 22. The changer of claim 10, wherein the second lever rod is movable and the roller rotates when the second lever rod moves into the second spiral groove and presses against the bottom section of the second spiral groove.

[c23] 23. A changer for driving a first module and a second module, the changer comprising:
a roller having a latching element thereon, wherein the roller latches with either the first module or the second module through the latching element, the roller further includes a spiral groove on a side surface, the spiral groove spirals around a central axis of the roller and depth of the spiral groove increases gradually; and

a lever rod capable of dipping into the spiral groove and pressing against the bottom surface of the spiral groove.

[c24] 24. The changer of claim 23, wherein the first module is an optical module and the second module is a printer module.

[c25] 25. The changer of claim 23, wherein the first module is a printer module and the second module is an optical module.

[c26] 26. The changer of claim 23, wherein depth of the spiral groove increases in a clockwise direction.

[c27] 27. The changer of claim 23, wherein depth of the spiral groove increases in an anti-clockwise direction.

[c28] 28. The changer of claim 23, wherein the latching element is a bump-shape structure attached to the perimeter surface of the roller.

[c29] 29. The changer of claim 23, wherein the latching element is located on the perimeter surface of the roller and the latching element retracts into the interior of the roller when an external force is applied to the latching element and the latching element springs back to its original position when the external force is removed.

[c30] 30. The changer of claim 23, wherein the lever rod is

fixed in position and the roller rotates by moving the roller towards the first lever rod so that the end of the first lever rod presses against the bottom section of the first spiral groove.

[c31] 31. The changer of claim 23, wherein the lever rod is movable and the roller rotates when the lever rod moves into the spiral groove and presses against the bottom section of the spiral groove.

[c32] 32. A method of operating a multi-module system that uses a changer to drive either a first module or a second module, the method comprising the steps of:
step one: providing a changer having:
a first lever rod;
a second lever rod;
a roller having a latching element, wherein the roller has a first spiral groove on a side surface of the roller and the first spiral groove spirals around the central axis of the roller such that depth of the first spiral groove increases gradually, and the roller also has a second spiral groove on the side surface of the roller and the second spiral groove spirals around the central axis of the roller such that depth of the second spiral groove increases gradually, depth of the first spiral groove increases in a direction opposite to the second spiral groove, the roller travels in a straight line, the first lever rod and the sec-

ond lever rod are positioned at the same end of the traveling path of the roller, and the roller further includes a latching element attached to the perimeter surface of the roller; wherein if the latching element on the roller of the changer engages with the first module initially, the changer is able to drive the first module;
step two: the roller moves to one end of its traveling path close to the first lever rod;
step three: the first lever rod dips into the first spiral groove and presses against the bottom surface of the first spiral groove so that the roller rotates, the latching element on the roller detaches from the first module and re-engages with the second module;
step four: the roller moves and pulls the second module along the traveling path of the roller;
step five: the roller moves to another end of the traveling path of the roller close to the second lever rod;
step six: the second lever rod dips into the second spiral groove and presses against the bottom surface of the second spiral groove so that the roller rotates, the latching element on the roller detaches from the second module and re-engages with the first module; and
step seven: the roller moves and pull the first module along the traveling path of the roller.

[c33] 33. The method of claim 32, wherein the first module is

an optical module and the second module is a printer module.

[c34] 34. The method of claim 32, wherein the first module is a printer module and the second module is an optical module.

[c35] 35. The method of claim 32, wherein the latching element is a bump-shape structure.

[c36] 36. The method of claim 32, wherein the first lever rod is movable and the roller rotates when the first lever rod moves into the first spiral groove and presses against the bottom section of the first spiral groove.

[c37] 37. The method of claim 32, wherein the second lever rod is movable and the roller rotates when the second lever rod moves into the second spiral groove and presses against the bottom section of the second spiral groove.

[c38] 38. A method of operating a multi-module system that uses a changer to drive either a first module or a second module, the method comprising the steps of:
step one: providing a changer having:
a first lever rod;
a second lever rod;
a roller having a latching element, wherein the roller has

a first side surface and a corresponding second side surface, the roller also has a first spiral groove and a second spiral groove, the first spiral groove is on the first side surface of the roller and spirals around the central axis of the roller such that depth of the first spiral groove increases gradually, the second spiral groove is on the second side surface of the roller and spirals around the central axis of the roller such that depth of the second spiral groove increases gradually, the roller travels in a straight line, the first lever rod and the second lever rod are positioned at the opposite end of the traveling path of the roller, and the roller further includes a first latching element, a second latching element and a third latching element attached to the perimeter surface of the roller;

wherein if the first latching element on the roller of the changer engages with the first module initially, the changer is able to drive the first module;

step two: the roller moves to one end of its traveling path close to the first lever rod;

step three: the first lever rod dips into the first spiral groove and presses against the bottom surface of the first spiral groove so that the roller rotates in a first direction, the first latching element on the roller detaches from the first module and the second latching element re-engages with the first module;

step four: the roller moves to another end of its traveling path close to the second lever rod;
step five: the second lever rod dips into the second spiral groove and presses against the bottom surface of the second spiral groove so that the roller rotates in a second direction just opposite to the first direction, the second latching element on the roller detaches from the first module and the third latching element on the roller re-engages with the second module;
step six: the roller moves and pulls the second module along the traveling path of the roller;
step seven: the roller moves to another end of its traveling path close to the second lever rod;
step eight: the second lever rod dips into the second spiral groove and presses against the bottom surface of the second spiral groove so that the roller rotates in the second direction, the third latching element of the roller detaches from the second module and the first latching element of the roller re-engages with the first module; and
step nine: the roller moves and pulls the first module along the traveling path of the roller.

[c39] 39. The method of claim 38, wherein the first module is an optical module and the second module is a printer module.

[c40] 40. The method of claim 38, wherein the first module is a printer module and the second module is an optical module.

[c41] 41. The method of claim 38, wherein the first latching element has a bump-shape structure located on the perimeter surface of the roller and that the first latching element retracts into the interior of the roller when an external force is applied to the first latching element and the first latching element springs back to its original position when the external force is removed.

[c42] 42. The method of claim 38, wherein the second latching element has a bump-shape structure located on the perimeter surface of the roller and the second latching element retracts into the interior of the roller when an external force is applied to the second latching element and the second latching element springs back to its original position when the external force is removed.

[c43] 43. The method of claim 38, wherein the third latching element has a bump-shape structure located on the perimeter surface of the roller and the third latching element retracts into the interior of the roller when an external force is applied to the third latching element and the third latching element springs back to its original

position when the external force is removed.

[c44] 44. The method of claim 38, wherein the first lever rod is movable and the roller rotates when the first lever rod moves into the first spiral groove and presses against the bottom section of the first spiral groove.

[c45] 45. The method of claim 38, wherein the second lever rod is movable and the roller rotates when the second lever rod moves into the second spiral groove and presses against the bottom section of the second spiral groove.